Samoa Joint Cannery Outfall

2004 Tradewind Season

Effluent Bioassay Test Results

September 2004 Sampling

16 November 2004

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TECHNICAL MEMORANDUM

BIOASSAY TESTING – JOINT CANNERY OUTFALL EFFLUENT SEPTEMBER 2004 SAMPLING

Prepared For: StarKist Samoa (NPDES Permit AS0000019)
COS Samoa Packing (NPDES Permit AS0000027)

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Date: 16 November 2004

Distribution: Carl Goldstein
United States Environmental Protection Agency, Region 9
Peter Peshut
American Samoa Environmental Protection Agency

Purpose

This memorandum presents the results of the bioassay testing of the Joint Cannery Outfall effluent sample that was collected in September 2004. The testing is required by the NPDES Permits that became effective in January 2001. This is the eighth required semi-annual test required by the current permits and the twenty-fourth test, over twenty-two semi-annual periods, conducted since testing of the Joint Cannery Outfall effluent began in 1993[1].

Study Objectives

Section D.1 of the StarKist Samoa and COS Samoa Packing NPDES Permits requires that semiannual definitive acute bioassays (96-hour static bioassays) be conducted on the cannery effluent. The purpose of these tests is to determine whether, and at what effluent concentration, acute toxicity may be detected for the combined joint cannery effluent discharge into Pago Pago Harbor.

[1] Testing was not conducted during 1999. Extra tests using two organisms were conducted in March 1995 and February 1996.

Study Approach

U.S. EPA has conducted a number of reviews of the effluent sampling, analysis, and bioassay tests conducted in the past. All comments from U.S. EPA have been incorporated into the sampling and sample handling standard operating procedures (SOP) or have been incorporated into the procedures used by the laboratory doing the test. The comments, responses, and SOP have been documented in previous reports.

The permit conditions require that the bioassay tests be conducted with the white shrimp, *Penaeus vannami* (postlarvae). In the event *Penaeus vannami* is not available at the time of the tests, the permit specifies the substitute species, *Mysidopsis bahia*, which now has been renamed *Americamysis bahia*. For the September 2004 sampling, *Penaeus vannami* was not available and *Americamysis bahia* was used.

Effluent samples were collected from the StarKist Samoa and COS Samoa Packing facilities as 24-hour composite samples. The acute effluent bioassay test was conducted using a combined, flow-weighted, composite effluent sample made up from the effluent samples from both canneries, as allowed by the permit condition. This combined effluent bioassay is representative of the wastewater discharged from the joint cannery outfall to Pago Pago Harbor.

Effluent Sampling Methods

Between 1000 on 23 September 2004 and 0700 on 24 September 2004, 24-hour flow-weighted composite samples of final effluent were collected from both the StarKist Samoa and COS Samoa Packing effluent discharges. Samples were collected from the established effluent sampling sites. Detailed sampling procedures are described in the established SOP for cannery effluent sampling.

A total of eight grab samples were collected into 1-gallon plastic cubitainers at each plant. Samples were collected at approximately three-hour intervals over a 24-hour period. The samples were stored on ice or in a refrigerator until the completion of the 24-hour sampling period. After all samples were collected a flow-proportioned composite sample was prepared. The grab sample collection times, effluent flow rates, and the relative effluent flow volumes calculated from plant flow records are summarized in Table 1. The relative effluent flow volumes were used to prepare the final composite sample, which was used to fill the sample container shipped to the laboratory for testing.

A 5-gallon cubitainer containing the composite sample was packed on ice in an ice chest for shipment to the laboratory. A chain-of-custody form for the sample was completed and sealed into a zip-lock bag and taped inside the lid of the ice chest. The sample was shipped via DHL to the testing laboratory. The chain-of-custody form and the DHL waybill are provided in Attachment I.

Table 1
StarKist Samoa and COS Samoa Packing
24-hour Composite Effluent Sample for Bioassay Testing
September 2004

Grab Sample Number	COS Samoa Packing		StarKist Samoa		COS Samoa Packing Percent of Total Flow	StarKist Samoa Percent Of Total Flow
	Sampling Date and Time	Effluent Flow Rate (mgd)	Sampling Date and Time	Effluent Flow Rate (mgd)		
1	23 Sept 2004 1000	0.60	23 Sept 2004 1000	1.44	0.0254	0.0610
2	1300	0.38	1300	2.13	0.0161	0.0901
3	1600	0.68	1600	2.92	0.0288	0.1235
4	1900	0.68	1900	2.50	0.0288	0.1055
5	2200	0.56	2200	2.73	0.0237	0.1154
6	24 Sept 2004 0100	0.56	24 Sept 2004 0100	2.53	0.0237	0.1070
7	0400	0.56	0400	2.76	0.0237	0.1166
8	0700	0.66	0700	1.96	0.0279	0.0829
Total		4.68		18.97	0.1979	0.8021
Mean		0.59		2.37	Total = 1.00	

Bioassay Testing Procedures

EnviroSystems, Inc. located in Hampton, New Hampshire conducted the bioassay tests. The testing procedures and results of the bioassay tests are provided in the Laboratory report included as Attachment II. This report summarizes the 96-hour acute bioassay test conducted with reference to the U.S. EPA document Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (EPA-821-R-02-012), 2002 as the sources of methods for conducting the test. The bioassay test was conducted considering and including U.S. EPA's comments on previous bioassay tests, as documented in previous reports.

The test organisms were ≤ 5 days old and the test temperature was to be held at 20 ±1°C, with actual temperatures ranging between 20°C and 22°C. Salinity was adjusted to 25 ppt at the start of the test and ranged during the test between 24 and

28 ppt. Demonstrated potential for a lethal immediate dissolved oxygen demand (IDOD) had been discussed and documented in previous bioassay technical memoranda, which describe the first two tests conducted in 1993. Therefore, all of the bioassay test chambers were continuously aerated during the bioassay tests to maintain adequate levels of dissolved oxygen (DO)[2]. The test was renewed with oxygenated sample at 48 hours.

Bioassay tests were carried out for effluent concentrations of 50, 25, 12.5, 6.25, and 3.1 percent as vol:vol dilutions in seawater. Water quality was monitored daily and parameters measured included DO, pH, salinity, and temperature. Total residual chlorine and ammonia were measured. Water quality data are provided in the Laboratory Report (Attachment II). Reference toxicant tests using sodium dodecyl sulfonate (SDS) are conducted regularly by ESI with the last one completed on 29 September 2004 and results were within one standard deviation of the historic laboratory mean.

Summary Results: Americamysis bahia Effluent Bioassay

All results from the bioassay tests are included in Attachment II. The results of the mysid bioassay tests indicate the 96-hour LC_{50} for the effluent tested was >50 percent. The no observable effects concentration (NOEC) for the 96-hour bioassay was 50 percent and the least observable effects concentration (LOEC) was >50 percent. Results on a daily basis are summarized in Table 2.

Table 2
StarKist Samoa and COS Samoa Packing
Combined Effluent Bioassay Results
September 2004 Sampling

Exposure Time	Parameter		
	LC_{50}	NOEC[1]	LOEC
24 hours	>50%	50%	>50%
48 hours	>50%	50%	>50%
72 hours	>50%	50%	>50%
96 hours	>50%	50%	>50%

[1] Highest concentration tested was 50% so NOEC can be considered ≥50%

[2] The high initial dilution of the actual effluent discharge (>100:1) into the Harbor, in a very short time, removes any concern about IDOD effects in the receiving water.

Discussion

Table 3 summarizes the results of the effluent bioassay tests for the samples collected in the September 2004 sampling compared to the previous bioassay tests. The LC_{50}, NOEC, and LOEC are within the range or higher than that obtained from previous tests where *Americamysis bahia* (*Mysidopsis bahia*) was used in place of *Penaeus vannami*. Figure 1 summarizes the LC_{50} for the mysid and penaeid tests done since February 1993. Figure 2 presents the range of LC_{50} results for mysids tests conducted since 1994. There is some variability observed in test results. The September 2004 test results along with the previous test results, for February 2004, were the highest LC_{50} values recorded for this organism. Higher LC_{50} values indicate lower whole effluent toxicity. There is a possible trend toward lower toxicity (higher LC_{50}) with time (see Figure 2). The trend is statistically significant at the <5% level. However, the actual significance and reason for the trend is unknown.

Conclusions

The bioassay tests for the Joint Cannery Outfall effluent for September 2004 do not indicate effluent toxicity levels to be of concern. As discussed in the previous bioassay test reports on the effluent, the time scale of the mixing of the effluent with the receiving water is on the order of seconds to achieve dilutions that will eliminate possible toxic effects as reflected by the bioassay results. For example, an LC_{50} of 50%, which was observed in September 2004, corresponds to a dilution of 2:1, which is achieved within one second and within one meter of the discharge point. The discharge is located in about 180 feet of water and the effluent toxicity tests indicate that the discharge is diluted to non-toxic levels immediately after discharge and well within the initial dilution plume.

Table 3
StarKist Samoa and COS Samoa Packing
Combined Effluent Bioassay Results

Date	Species	Parameters		
		LC_{50}	NOEC	LOEC
2/93	*Penaeus vannami*	4.8%[1]	3.1%	6.25%
10/93	*Penaeus vannami*	15.67%	3.1%	6.25%
2/94	*Penaeus vannami*	15.76%	<1.6%	1.6%
10/94	*Mysidopsis bahia*[2]	31.2%	25%	50%
3/95	*Penaeus vannami*	14.8%	6.25%	12.5%
3/95	*Mysidopsis bahia*[3]	10.8%	6.25%	12.5%
2/96	*Penaeus vannami*	>50%	>50%	>50%
2/96	*Mysidopsis bahia*[3]	28.36%	12.5%	25%
3/96	*Penaeus vannami*	44.4%	25%	50%
11/96	*Penaeus vannami*	7.11%	3.1%	6.25%
03/97	*Penaeus vannami*	39.36%	12.5%	25%
09/97	*Penaeus vannami*[4]	12.3%	6.25%	12.5%
06/98	*Mysidopsis bahia*[2]	17.2%	6.25%	12.5%
11/98	*Mysidopsis bahia*[2]	15%	6.25%	12.5%
02/00	*Mysidopsis bahia*[2]	20%	6.25%	12.5%
08/00	*Mysidopsis bahia*[2]	17.1%	3.1%	6.25%
03/01	*Americamysis bahia*[2,5]	13.8%	12.5%	25%
10/01	*Americamysis bahia*[2,6]	37.5%	25.0%	50.0%
3/02	*Americamysis bahia*[2,6]	16.1%	12.5%	25%
8/02	*Americamysis bahia*[2,6]	10.23%	6.25%	12.5%
03/03	*Americamysis bahia*[2,6]	28.4%	25%	50%
08/03	*Americamysis bahia*[2,6]	43.2%	25.0%	50.0%
02/04	*Americamysis bahia*[2,6]	>50%	50%	>50%
09/04	***Americamysis bahia***[2,6]	**>50%**	**50%**	**>50%**

[1]The February 1993 samples were not aerated until after the first day of the test. For subsequent tests the samples were aerated for the entire duration of the tests.
[2]*Mysidopsis bahia* used as substitutes because *Penaeus vannami* not available: as directed and approved by U. S. EPA.
[3]*Mysidopsis bahia* used in addition to *Penaeus vannami* as described in text of technical memorandums reporting test results. Only one species is required by the permit conditions.
[4]Stage 1 (3 mm) *Penaeus vannami* were used for testing because older Stage 7 and 8 (8-10 mm) *Penaeus vannami* were not available.
[5]*Mysidopsis bahia* renamed *Americamysis bahia*. Results indicate increased toxicity because of low DO in renewal concentrations as renewal water was not aerated prior to use
[6] *Mysidopsis bahia* renamed *Americamysis bahia*

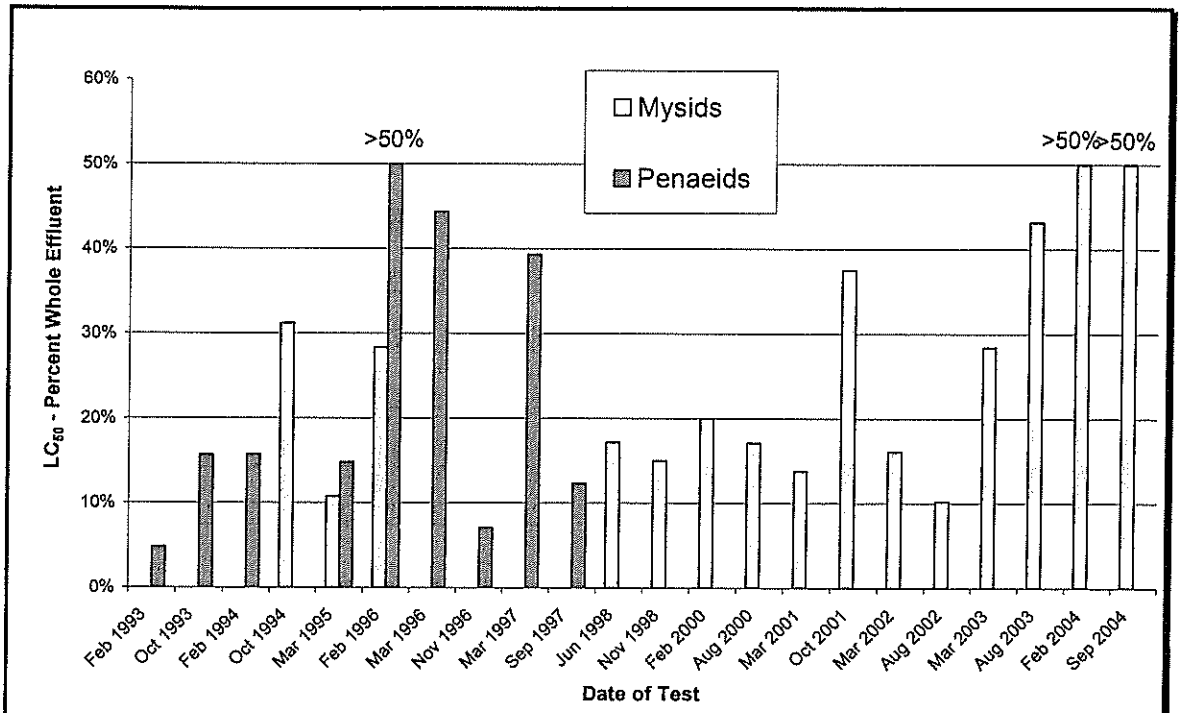

Figure 1. LC_{50} for Mysid and Penaeid Tests

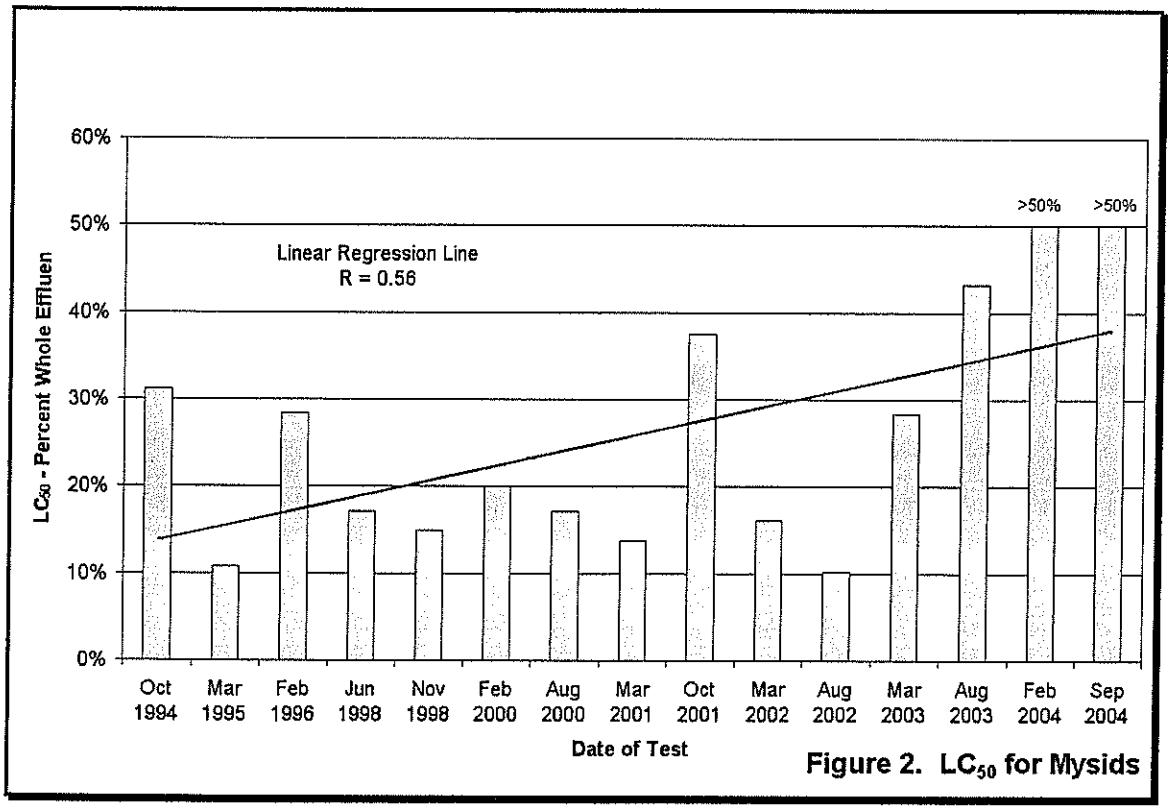

Figure 2. LC_{50} for Mysids

ATTACHMENT I

Chain-of-Custody

Samoa

CH2M HILL
APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project #: 147323.JC.04.TW
Purchase Order #:
Project Name: SAMOA JOINT CANNERY OUTFALL
Company Name/CH2M HILL Office: CH2M HILL
Project Manager & Phone #: Mr. [ ] Ms. [ ] Dr. [ ] STEVE COSTA 707-677-0123
Report Copy to: SAME 707-677-0123
Requested Completion Date:
Sampling Requirements: SDWA [ ] NPDES [ ] RCRA [ ] OTHER ____
Sample Disposal: Dispose [ ] Return [ ]

LAB TEST CODES

SHADED AREA - FOR LAB USE ONLY
Lab 1 #: 12584
Lab 2 #:
Quote #:
Kit Request #:
Project #:
No. of Samples:
Page ___ of ___
Login:
LIMS Ver:

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	ANALYSES REQUESTED	REMARKS	LAB 1 ID	LAB 2 ID
9/23	24	X		X			JC0-04TW	1	BIOASSAY TEST w/ MYSID 96-HR STATIC RENEWAL	-001		

Sampled By & Title (Please sign and print name): S. Costa — Date/Time: 9/24/04
Received By (Please sign and print name): — Date/Time: 10/1/04 1510
Received By (Please sign and print name): — Date/Time:
Received By (Please sign and print name): — Date/Time:
Work Authorized By (Please sign and print name):

Relinquished By (Please sign and print name): S. Costa — Date/Time: 9/24/04
Relinquished By (Please sign and print name): — Date/Time:
Relinquished By (Please sign and print name): — Date/Time:

QC Level: 1 2 3 Other:
COC Rec: ICE
Ana Req: TEMP
Cust Seal: Ph

Shipped Via: UPS BUS Fed-Ex Hand Other DHL
Shipping # 8446187702

Remarks: MAINTAIN DO LEVELS - AERATE CONTINUOUSLY & BEFORE RENEWAL

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

REORDER 920701629-1 QTY 25

Shipment Airwaybill

DHL WORLDWIDE EXPRESS

1-800-CALL-DHL (Non negotiable) In USA only

WEB ADDRESS: http://www.dhl.com

PPF PPF

8446187702

Quote this shipment number in an inquiry

4/05/01 6

ORIGIN	DESTINATION
SLV	PRT

1 From (Shipper)

Account no.: 920701629

Shipper's reference: 147323.JZ.04.TWI

Company name: CH2M HILL

Shipper's name: STEVE COSTA / JIM CRAWFORD

Address: ~~777 108TH AVE NE~~ ~~BELLEVUE WA~~ Lefalepule Faga'alu American Samoa ~~(684) 633-5261~~

Zip code (required): ~~98004-5112~~ 96799

Phone/Fax/E-mail circle one (required): (425)453-5000

2 To (Recipient)

Company name: ENVIROSYSTEMS, INC

Attention: PETRA KARBE

Delivery address: ONE LAFAYETTE ROAD HAMPTON, NEW HAMPSHIRE USA

Zip/Postcode (required): 03842

Phone/Fax/E-mail circle one (required): 603-962-3345

3 Shipment details

Domestic Services
- ☐ USA OVERNIGHT

International Services
- ☐ INT'L DOCUMENT EXPRESS
- ☐ WORLDWIDE PRIORITY EXPRESS (non document shipments / unlimited weight)
- ☒ WORLDFREIGHT (Prior arrangements required / 220 lbs. Minimum)

WorldMail Services ☐ 1st
- ☐ APM ☐ 2nd ☐ IPA ☐ ISAL

Special Services extra charges may apply
- ☐ SATURDAY DELIVERY (not available to all locations)
- ☐ POD (Shipper's fax/e-mail for POD (optional))
- ☐ OTHER

Payment Options not all options available to all countries
- ☒ Shipper's account
- ☐ Recipient ☐ Third party

Acct. No.

☐ Cash / Check / Credit Card circle one

No.

Expires. Type

Shipment insurance if desired, enter amount below

US $. Insured value

Full description of contents

WATER QUALITY SAMPLE FOR LABORATORY ANALYSIS

NO COMMERCIAL VALUE

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Declared value for customs (in US $): $50.00

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Drop Box/ Exp. Center #	
TOTAL	

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ATTACHMENT II

EnviroSystems, Inc. Laboratory Report

TOXICOLOGICAL EVALUATION OF A TREATED EFFLUENT: BIOMONITORING SUPPORT FOR A NPDES PERMIT OCTOBER 2004

American Samoa Joint Cannery Outfall

Prepared For

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October 2004
Reference Number CH2M-Samoa12584-04-10

STUDY NUMBER 12584

EXECUTIVE SUMMARY

The following summarizes the results of acute exposure bioassays performed from October 1-5, 2004 in support of the NPDES biomonitoring requirements of the American Samoa Joint Cannery Outfall. The 96 hour acute definitive assay was conducted using the marine species, *Americamysis bahia.*

Acute Toxicity Evaluation

Species	Exposure	LC-50	NOEC	LOEC
Americamysis bahia	24-Hours	>50%	50%	>50%
	48-Hours	>50%	50%	>50%
	72-Hours	>50%	50%	>50%
	96-Hours	>50%	50%	>50%

TOXICOLOGICAL EVALUATION
OF A TREATED EFFLUENT:
BIOMONITORING SUPPORT FOR A NPDES PERMIT
OCTOBER 2004

American Samoa Joint Cannery Outfall

1.0 INTRODUCTION

Acute toxicity tests involve preparing a series of concentrations by diluting effluent with control water. Groups of test organisms are exposed to each effluent concentration and a control for a specified period. In acute tests, mortality data for each concentration are used to calculate (by regression) the median lethal concentration, or LC-50, defined as the effluent concentration which kills half of the test organisms. Samples with high LC-50 values are less likely to cause significant environmental impact. The acute no observed effect concentration (NOEC) and lowest observed effect concentration (LOEC) document the highest and lowest effluent concentrations that have no impact and a significant impact on the test species, respectively.

This report presents the results of an acute toxicity test conducted on an effluent sample collected from the American Samoa Joint Cannery Outfall. Testing was based on programs and protocols developed by the US EPA (2002) and involved conducting 96 hour acute static renewal toxicity tests with the marine species, *Americamysis bahia*. Testing was performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire in accordance with the provisions of the NELAC Standards (2000).

2.0 MATERIALS AND METHODS

2.1 General Methods

Toxicological and analytical protocols used in this program follow procedures primarily designed by the EPA to provide standard approaches for the evaluation of toxicological effects of discharges on aquatic organisms, and for the analysis of water samples. See Section 4.0 for a list of references.

2.2 Test Species

Every attempt was made to acquire the species, *Penaeus vannami,* as this is the preferred organism under the Cannery's permit. ESI was unable to obtain reasonably priced *P. vannami.* Due to the exorbitant expense, the decision was made to use an alternate species, *Americamysis bahia*.

A. bahia, ≤5 days old, were from maintained at ESI. Test organisms were transferred to test chambers by large bore pipet, minimizing the amount of water added to test solutions.

2.3 Effluent and Dilution Water

The effluent sample used in the assay was identified as "JCO-04TW." Sample collection information is provided in Table 4. Upon receipt, the sample was stored at 4°C. All sample material used in the assay was warmed to 20±1°C prior to preparing test solutions. Total residual chlorine (TRC) was measured using amperometric titration (MDL 0.05 mg/L). As the effluent sample contained <0.05 mg/L, TRC dechlorination with sodium thiosulfate was not required (EPA 2002). Aliquots of the undiluted effluent sample were collected for ammonia analysis when the sample arrived and again prior to renewal. Upon arrival, the effluent sample had a salinity of 12‰. Salinity of the effluent was increased to 25‰ by the addition of artificial sea salts. Test concentrations for the assays were 50%, 25%, 12.5%, 6.25% and 3.1% effluent with a laboratory water diluent control.

The dilution water used in this assay was collected from the sea water system at ESI. The water is pumped in daily from the Hampton Estuary on the flood tide, filtered through a high volume sand filter, and stored in 3000 gallon polyethylene tanks. The water is classified as Class SA-1 by the State of New Hampshire, and has been used to culture test organisms for over 20 years. Sea water used in the assay had a salinity of 25±2‰ and a TRC of <0.05 mg/L.

2.4 Acute Toxicity Tests

The 96 hour acute static renewal toxicity test was conducted at 20±2°C with a photoperiod of 16:8 hours light:dark. Test chambers for the acute assays were 250 mL glass beakers containing 200 mL test solution in each of 5 replicates, with 10 organisms/replicate. Survival, dissolved oxygen, pH, salinity and temperature were measured daily in all replicates. Test solutions were renewed after 48 hours using effluent from the start sample. Mysid shrimp were fed daily with <24 hour old brine shrimp.

2.5 Data Analysis

At 24 hour intervals, survival data was analyzed to assess toxicity using a program developed by Stephan (1982). LC-50 values were computed using the Spearman-Karber, Binomial, and Probit methods. If survival in the highest test concentration was >50%, LC-50 values were obtained by direct observation of the raw data. The NOEC was determined as the highest test concentration which caused no significant mortality while the LOEC was determined as the lowest concentration that did cause significant mortality.

2.6 Quality Control

As part of the laboratory quality control program, standard reference toxicant assays are conducted on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. See Table 2 for details.

Note: No Page 5 of 9 in original ESI Report, and no information missing

TABLE 1. **Summary of Acute Evaluation Results. American Samoa Joint Cannery Outfall Effluent Evaluation. October 2004.**

Concentration % Effluent	Exposure	Replicates A	B	C	D	E	Mean	Standard Deviation	Coefficient of Variation
Lab Control	Start	10	10	10	10	10	100%	0.000	0.00%
	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	10	100%	0.000	0.00%
	72 Hours	10	9	10	10	10	98%	0.400	4.08%
	96-Hours	10	9	10	10	10	98%	0.400	4.08%
3.1%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	9	98%	0.400	4.08%
	72 Hours	10	10	10	10	9	98%	0.400	4.08%
	96-Hours	10	9	10	10	9	96%	0.490	5.10%
6.25%	24-Hours	10	10	10	10	9	98%	0.400	4.08%
	48-Hours	10	10	10	10	9	98%	0.400	4.08%
	72 Hours	9	9	10	10	7	90%	1.095	12.17%
	96-Hours	9	9	10	10	7	90%	1.095	12.17%
12.5%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	10	100%	0.000	0.00%
	72 Hours	10	10	10	10	10	100%	0.000	0.00%
	96-Hours	10	10	10	10	10	100%	0.000	0.00%
25%	24-Hours	10	10	10	9	10	98%	0.400	4.08%
	48-Hours	10	10	10	9	10	98%	0.400	4.08%
	72 Hours	10	9	10	9	10	96%	0.490	5.10%
	96-Hours	10	9	10	9	10	96%	0.490	5.10%
50%	24-Hours	10	9	10	10	10	98%	0.400	4.08%
	48-Hours	10	9	10	6	3	76%	2.728	35.89%
	72 Hours	9	8	10	6	3	72%	2.482	34.47%
	96-Hours	9	8	10	6	3	72%	2.482	34.47%

SUMMARY OF ENDPOINTS

Exposure Period	LC-50 (95% Limits)	METHOD	NOEC	LOEC
24 Hours	>50%	Direct	50%	>50%
48 Hours	>50%	Direct	50%	>50%
72 Hours	>50%	Direct	50%	>50%
96 Hours	>50%	Direct	50%	>50%

TABLE 2. **Summary of Reference Toxicant Data. American Samoa Joint Cannery Outfall Effluent Evaluation. February 2004.**

Concentrations Expressed as mg/L Sodium Dodecyl Sulfate

Species	Date	LC-50	Historic Mean	Number of Tests	±1 STD Deviation	±2 STD Deviations
A. bahia	09/29/04	19.4	21.2	20	3.59	7.19

TABLE 3. **Summary of Effluent and Diluent Characteristics. American Samoa Joint Cannery Outfall Effluent Evaluation. October 2004.**

PARAMETER	UNITS	100% EFFLUENT	50% EFFLUENT	DILUENT
Salinity - As Received	‰	12	-	24
Salinity - After Salinity Adjustment	‰	25	25	-
pH - As Received	SU	6.48	-	8.05
pH - After Salinity Adjustment	SU	6.72	6.97	-
TRC - As Received	mg/L	‡	-	<0.05
Dissolved Oxygen - As Received	mg/L	0.9	-	-
Dissolved Oxygen - After Aeration	mg/L	-	4.8	7.6
Ammonia - As Received	mg/L as N	59	-	<0.1
Unionized Ammonia - As Received	mg/L as N	0.076	-	<0.005
Ammonia - Salinity Adjusted	mg/L as N	-	29	-
Unionized Ammonia - Salinity Adjusted	mg/L as N	-	0.115	-
Ammonia - at 48 Hours	mg/L as N	59	29	<0.1
Unionized Ammonia - at 48 Hours	mg/L as N	0.085	0.559	<0.005

TABLE 4. **Summary of Sample Collection Information. American Samoa Joint Cannery Outfall Effluent Evaluation. October 2004.**

Sample Description	Type	Collection Date	Collection Time	Receipt Date	Receipt Time	Arrival Temp °C
EFFLUENT	Comp	09/23-24/04	ND	10/01/04	1510	21

COMMENTS:
‡ - Analysis could not be performed due to interference.
ND - No data was recorded on chain of custody.

TABLE 5. **Summary of StarKist Samoa and COS Samoa Packing Combined Effluent Bioassay Results. American Samoa Joint Cannery Outfall Effluent Evaluation. October 2004.**

Date	Species	96-Hour Endpoints		
		LC-50	NOEC	LOEC
02/93[1]	*Penaeus vannami*	4.8%	3.1%	6.25%
10/93[1]	*Penaeus vannami*	15.67%	3.1%	6.25%
02/94[1]	*Penaeus vannami*	15.76%	<1.6%	1.6%
10/94[1]	*Americamysis bahia*	31.2%	25.0%	50.0%
03/95[1]	*Penaeus vannami*	14.8%	6.25%	12.5%
03/95[1]	*Americamysis bahia*	10.8%	6.25%	12.5%
02/96[1]	*Penaeus vannami*	>50.0%	>50.0%	>50.0%
03/96[1]	*Penaeus vannami*	44.4%	25.0%	50.0%
11/96[1]	*Penaeus vannami*	7.11%	3.1%	6.25%
03/97[1]	*Penaeus vannami*	39.36%	12.5%	25.0%
09/97[1]	*Penaeus vannami*	12.3%	6.25%	12.5%
06/98[1]	*Americamysis bahia*	17.2%	6.25%	12.5%
11/98[1]	*Americamysis bahia*	15.0%	6.25%	12.5%
02/00[1]	*Americamysis bahia*	20.0%	6.25%	12.5%
08/00[1]	*Americamysis bahia*	17.1%	3.1%	6.25%
03/01[2]	*Americamysis bahia*	13.81%	12.5%	25.0%
03/02[2]	*Americamysis bahia*	16.13%	12.5%	25.0%
08/02[2]	*Americamysis bahia*	10.23%	6.25%	12.5%
03/03[2]	*Americamysis bahia*	28.4%	25.0%	50.0%
08/03[2]	*Americamysis bahia*	43.2%	25.0%	50.0%
03/04[2]	*Americamysis bahia*	>50.0%	50.0%	>50.0%
10/04[2]	*Americamysis bahia*	>50.0%	50.0%	>50.0%

Notes:

1. Assays conducted by Advanced Biological Testing, Inc., Rohnert Park, California
2. Assays conducted by EnviroSystems, Inc., Hampton, New Hampshire

APPENDIX A

DATA SHEETS

STATISTICAL SUPPORT

Contents	Number of Pages
Methods Used in NPDES Permit Biomonitoring Testing	1
A. bahia Acute Bioassay Data Summary	2
A. bahia Survival Statistics: LC-50, NOEC	4
A. bahia Organism Culture Sheet	1
Preparation of Dilutions	1
Record of Meters Used for Water Quality Measurements	1
Unionized Ammonia Calculation	1
Sample Receipt Record	1
Chain of Custody	1

METHODS USED IN NPDES PERMIT BIOMONITORING TESTING

Parameter	Method
Acute Exposure Bioassays	
Ceriodaphnia dubia, Daphnia pulex	EPA-821-R-02-012
Pimephales promelas	EPA-821-R-02-012
Americamysis bahia	EPA-821-R-02-012
Menidia beryllina, Cyprinodon variegatus	EPA-821-R-02-012
Chronic Exposure Bioassays	
Ceriodaphnia dubia	EPA-821-R-02-013, 1002.0
Pimephales promelas	EPA-821-R-02-013, 1000.0
Cyprinodon variegatus	EPA-821-R-02-014, 1004.0
Menidia beryllina	EPA-821-R-02-014, 1006.0
Arbacia punctulata	EPA-821-R-02-014, 1008.0
Champia parvula	EPA-821-R-02-014, 1009.0
Trace Metals:	
ICP Metals	EPA 200.7/SW 6010
Hardness	Standard Methods 20th Edition - Method 2340 B
Wet Chemistries:	
Alkalinity	EPA 310.2
Chlorine, Residual	Standard Methods 20th Edition - Method 4500CLD
Total Organic Carbon	Standard Methods 20th Edition - Method 5310C
Specific Conductance	Standard Methods 20th Edition - Method 2510B
Nitrogen - Ammonia	Standard Methods 20th Edition - Method 4500NH3G
pH	Standard Methods 20th Edition - Method 4500H+B
Solids, Total (TS)	Standard Methods 20th Edition - Method 2540.B
Solids, Total Suspended (TSS)	Standard Methods 20th Edition - Method 2540D
Dissolved Oxygen	Standard Methods 20th Edition - Method 4500-O G

ACUTE BIOASSAY DATA SUMMARY

20°C

STUDY: 12584		"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES					
CLIENT: CH2M Hill	TEST ORGANISM: *A. bahia*		TRC	AMM 0 HR✖	AMM 48 HR✖	pH	DO	Salinity
SAMPLE: American Samoa	ORGANISM SUPPLIER/BATCH/AGE: *See Organism Culture Sheet*	EFFLUENT	See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet					
DILUENT: LAB SALT		DILUENT						

SALINITY ADJUSTMENT RECORD (IF APPLICABLE): 4000 ML EFFLUENT + 60 G SEA SALTS = 100% ACTUAL PERCENTAGE

CONC	REP	SURVIVAL					✦DISSOLVED OXYGEN (MG/L)✦						PH (SU)						TEMPERATURE (°C)						SALINITY (ppt)					
		0	24	48	72	96	0	24	48◇	48☆	72	96	0	24	48◇	48☆	72	96	0	24	48◇	48	72	96	0	24	48◇	48	72	96
LAB	A	10	10	10	10	10	7.6	7.2	7.0	7.0	7.1	7.3	8.05	8.05	8.06	8.05	8.09	8.04	21	22	22	22	22	21	24	27	25	25	26	27
	B	10	10	10	9	9	7.6	7.1	7.0	7.2	7.1	7.2	8.05	8.09	8.12	8.09	8.10	8.04	21	23	22	22	22	21	24	27	27	25	27	27
	C	10	10	10	10	10	7.6	7.1	7.1	7.2	7.2	7.1	8.05	8.10	8.10	8.09	8.10	8.04	21	22	22	22	22	22	24	27	27	26	28	29
	D	10	10	10	10	10	7.6	7.2	7.2	7.2	7.1	7.1	8.05	8.09	8.11	8.09	8.09	8.07	21	23	22	22	22	22	24	27	27	25	28	29
	E	10	10	10	10	10	7.6	7.1	7.0	7.3	7.2	7.1	8.05	8.10	8.05	8.08	8.06	8.04	21	23	22	22	21	22	24	27	27	25	27	28
3.1%	A	10	10	10	10	10	7.3	6.9	6.8	7.1	7.2	7.0	7.89	8.11	8.13	8.04	8.10	8.06	21	22	22	22	22	21	25	25	27	25	27	28
	B	10	10	10	9	9	7.3	7.0	7.0	7.1	7.0	7.2	7.89	8.16	8.15	8.04	8.05	8.06	21	22	22	22	22	22	25	25	26	25	27	28
	C	10	10	10	10	10	7.3	7.0	7.0	7.1	6.8	7.1	7.89	8.11	8.15	8.04	8.10	8.07	21	22	22	22	22	23	25	25	27	25	27	29
	D	10	10	10	10	10	7.3	7.0	6.9	7.1	6.9	7.1	7.89	8.12	8.14	8.04	8.09	8.09	21	23	22	22	22	23	25	25	27	25	27	29
	E	10	9	9	9	9	7.3	6.9	5.4	6.7	5.0	6.9	7.89	8.11	7.78	8.04	7.67	8.09	21	22	21	22	21	23	25	25	27	25	27	29
6.25%	A	10	10	10	9	9	7.2	6.9	6.8	7.0	7.2	6.9	7.85	8.15	8.12	7.98	8.07	8.04	21	22	21	22	21	20	25	25	27	26	27	28
	B	10	10	10	9	9	7.2	6.9	7.0	7.0	3.8	7.0	7.85	8.13	8.15	7.96	7.62	8.07	21	22	21	22	21	20	25	25	27	26	26	28
	C	10	10	10	10	10	7.2	6.7	6.9	7.0	7.1	7.1	7.85	8.18	8.17	7.97	8.03	8.09	21	22	21	22	21	21	25	25	27	26	27	28
	D	10	10	10	10	10	7.2	6.8	7.0	6.8	7.0	7.2	7.85	8.15	8.10	7.95	8.06	8.06	21	22	21	22	21	21	25	25	27	26	27	28
	E	10	9	9	9	7	7.2	6.8	5.2	6.7	4.0	7.0	7.85	8.14	7.76	7.89	7.61	8.08	21	22	21	22	21	21	25	25	27	26	27	28
DATE		9/6/04	10/2	10/3	10/4/04	10/5	10/1/04	10/2	10/3	10/3	10/4/04	10/5																		
TIME		1635	1440	1445	1415	1620	1600	1430	1420	1515	1345	1645																		
INITIALS			ICR	TP		TP	BB	ICR	TP	TP		TP																		
FED?																														

Pull NH3 on 100% + 50% Effluent + Lab Salt at 48 hrs. Record pH prior to preservation.

✖ - See:" EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.
✦ - AERATE FROM START! ◇ - "Old" water qualities (prior to renewal) ☆ - "New"water qualities (post renewal)

ACUTE BIOASSAY DATA SUMMARY

		"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES						
STUDY: 12584	SAMPLE RECEIVED:							
CLIENT: CH2M Hill	TEST ORGANISM: *A. bahia*		TRC	AMM 0 HR✖	AMM 48 HR✖	pH	DO	Salinity
SAMPLE: American Samoa	ORGANISM SUPPLIER:	EFFLUENT	See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet					
DILUENT: LAB SALT	ORGANISM BATCH/AGE:	DILUENT						

CONC	REP	SURVIVAL 0	24	48	72	96	✦DISSOLVED OXYGEN (MG/L)✦ 0	24	48◇	48☆	72	96	PH (SU) 0	24	48◇	48☆	72	96	TEMPERATURE (°C) 0	24	48◇	48	72	96	SALINITY (ppt) 0	24	48◇	48	72	96
12.5%	A	10	10	10	10	10	6.9	6.7	6.4	6.6	6.9	6.8	7.60	8.19	8.07	7.83	8.04	8.12	21	22	21	22	22	21	25	25	26	25	26	27
	B	10	10	10	10	10	6.9	6.8	6.4	6.5	7.0	6.9	7.60	8.18	8.04	7.80	8.09	8.13	21	22	21	22	21	21	25	25	26	25	27	28
	C	10	10	10	10	10	6.9	6.7	6.3	6.5	7.0	7.0	7.60	8.15	8.08	7.78	8.08	8.11	21	22	21	22	22	21	25	25	26	25	26	28
	D	10	10	10	10	10	6.9	6.7	5.7	6.6	7.0	6.9	7.60	8.16	7.98	7.74	8.09	8.10	21	22	21	22	22	21	25	25	26	25	26	28
	E	10	10	10	10	10	6.9	6.6	5.9	6.4	6.9	7.0	7.60	8.12	8.03	7.77	8.10	8.09	21	22	22	22	22	21	25	25	27	25	27	28
25%	A	10	10	10	10	10	6.4	6.1	6.0	6.0	6.9	6.5	7.25	8.19	8.14	7.54	8.13	8.18	21	22	22	22	22	21	25	25	26	25	26	28
	B	10	10	10	9	9	6.4	6.2	6.1	6.0	6.7	6.9	7.25	8.23	8.15	7.59	8.12	8.19	21	22	22	22	23	21	25	25	27	25	27	28
	C	10	10	10	10	10	6.4	6.3	6.1	6.0	6.5	6.9	7.25	8.20	7.99	7.58	8.17	8.17	21	22	22	22	23	21	25	25	26	25	27	28
	D	10	9	9	9	9	6.4	6.2	5.5	5.8	6.4	6.7	7.25	8.19	8.07	7.54	8.10	8.16	21	22	22	22	23	21	25	25	26	25	26	28
	E	10	10	10	10	10	6.4	6.0	5.9	5.8	6.5	6.6	7.25	8.14	8.17	7.55	8.12	7.82	21	22	22	22	23	20	25	25	27	25	26	28
50%	A	10	10	10	9	9	4.8	6.2	5.7	4.2	6.4	6.5	6.97	8.30	8.19	7.32	8.13	8.22	21	22	21	22	22	20	25	25	26	25	27	28
	B	10	9	9	8	8	4.8	6.2	5.8	4.2	6.5	6.7	6.97	8.27	8.24	7.36	8.15	8.25	21	22	21	22	22	20	25	25	26	25	27	28
	C	10	10	10	10	10	4.8	6.0	6.0	3.9	6.5	6.8	6.97	8.25	8.19	7.45	8.16	8.27	21	22	21	22	22	20	25	25	26	25	27	28
	D	10	10	6	6	6	4.8	6.1	5.4	4.0	6.4	7.0	6.97	8.26	8.20	7.42	8.11	8.25	21	22	21	22	22	20	25	25	26	25	26	28
	E	10	10	3	3	3	4.8	6.0	5.4	4.0	6.4	6.8	6.97	8.15	8.22	7.42	8.15	8.24	21	22	21	22	22	20	25	25	26	25	27	28
DATE		10/1/04	10/2	10/3	10/4/04	10/5	10/1/04	10/2	10/3	10/3	10/4/04	10/5																		
TIME		1635	1450	1445	1415	1620	1600	1750	1420	1515	1345	1605																		
INITIALS		✓	KC	TP	✓	TP	BB	KC	TP	TP	✓	TP																		
FED?		✓																												

✖ - See:" EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.
✦ - AERATE FROM START! ◇ - "Old" water qualities (prior to renewal) ☆ - "New"water qualities (post renewal)

58448

Title: 12584 American Samoa: A. bahie 48hr Survival
File: 584ab48sv Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.5969
W = 0.7483

Critical W = 0.9000 (alpha = 0.01 , N = 30)
W = 0.9270 (alpha = 0.05 , N = 30)

Data FAIL normality test (alpha = 0.01). Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normality and should not be performed with this data as is.

Title: 12584 American Samoa: A. bahie 48hr Survival
File: 584ab48sv Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: 12584 American Samoa: A. bahie 48hr Survival
File: 584ab48sv Transform: ARC SINE(SQUARE ROOT(Y))

Summary Statistics on Transformed Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Lab	5	1.4120	1.4120	1.4120
2	3.1	5	1.2490	1.4120	1.3794
3	6.25	5	1.2490	1.4120	1.3794
4	12.5	5	1.4120	1.4120	1.4120
5	25	5	1.2490	1.4120	1.3794
6	50	5	0.5796	1.4120	1.1078

Title: 12584 American Samoa: A. bahie 48hr Survival
File: 584ab48sv Transform: ARC SINE(SQUARE ROOT(Y))

Summary Statistics on Transformed Data TABLE 2 of 2

58448

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Lab	0.0000	0.0000	0.0000	0.0000
2	3.1	0.0053	0.0729	0.0326	5.2837
3	6.25	0.0053	0.0729	0.0326	5.2837
4	12.5	0.0000	0.0000	0.0000	0.0000
5	25	0.0053	0.0729	0.0326	5.2837
6	50	0.1333	0.3651	0.1633	32.9575

Title: 12584 American Samoa: A. bahie 48hr Survival
File: 584ab48sv Transform: ARC SINE(SQUARE ROOT(Y))

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	Lab	1.4120				
2	3.1	1.3794	25.00	16.00	5.00	
3	6.25	1.3794	25.00	16.00	5.00	
4	12.5	1.4120	27.50	16.00	5.00	
5	25	1.3794	25.00	16.00	5.00	
6	50	1.1078	20.00	16.00	5.00	

Critical values are 1 tailed (k = 5)

5847296

Title: 12584 American Samoa: A. bahia 72 & 96 Hr Survival
File: 584ab7296ab Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.6257
W = 0.9083

Critical W = 0.9000 (alpha = 0.01 , N = 30)
W = 0.9270 (alpha = 0.05 , N = 30)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: 12584 American Samoa: A. bahia 72 & 96 Hr Survival
File: 584ab7296ab Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: 12584 American Samoa: A. bahia 72 & 96 Hr Survival
File: 584ab7296ab Transform: ARC SINE(SQUARE ROOT(Y))

Summary Statistics on Transformed Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Lab	5	1.2490	1.4120	1.3794
2	3.1	5	1.2490	1.4120	1.3468
3	6.25	5	0.9912	1.4120	1.2627
4	12.5	5	1.4120	1.4120	1.4120
5	25	5	1.2490	1.4120	1.3468
6	50	5	0.5796	1.4120	1.0468

Title: 12584 American Samoa: A. bahia 72 & 96 Hr Survival
File: 584ab7296ab Transform: ARC SINE(SQUARE ROOT(Y))

Summary Statistics on Transformed Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Lab	0.0053	0.0729	0.0326	5.2837

5847296

2	3.1	0.0080	0.0893	0.0399	6.6278
3	6.25	0.0297	0.1723	0.0770	13.6431
4	12.5	0.0000	0.0000	0.0000	0.0000
5	25	0.0080	0.0893	0.0399	6.6278
6	50	0.1055	0.3248	0.1453	31.0291

Title: 12584 American Samoa: A. bahia 72 & 96 Hr Survival
File: 584ab7296ab Transform: ARC SINE(SQUARE ROOT(Y))

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	Lab	1.3794				
2	3.1	1.3468	25.00	16.00	5.00	
3	6.25	1.2627	22.00	16.00	5.00	
4	12.5	1.4120	30.00	16.00	5.00	
5	25	1.3468	25.00	16.00	5.00	
6	50	1.0468	18.50	16.00	5.00	

Critical values are 1 tailed (k = 5)

EnviroSystems, Incorporated
Organism Culture Record

Client and ESI Study Number: American Samoa #12584
Assay: _____

I. Organism History

Species Americamysis bahia

Source Lab Reared ✓ Hatchery Reared _____ Field Collected _____

Hatch Date 9/28-10/1/04 Receipt Date _____ Age 1-5 days

Lot Number 100104AB Strain _____

Brood Origin Aquatic Research Organisms

II. Culture Conditions

System Recirc. SW

Diet Flake Food _____ Phytoplankton _____ Trout Chow _____

Brine Shrimp ✓ Rotifers _____ Other _____

Prophylactic Treatments _____

Comments _____

III. Water Quality

Temperature 24.5 °C Salinity 30.1 ppt DO_2 6.9 mg/L

pH 7.76 SU Hardness _____ mg/L Alkalinity _____ mg/L

Other _____

IV. Comments

_____

_____

_____

_____

_____

_____

_____

Biologist _____ Date 11/3/04

EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA

PARAMETER	100% Effluent	50% Effluent	Diluent - Lab Salt
TRC	Not Recorded - Interference		<0.05
As Received - pH (SU) @ 20°C	6.48		8.05
As Received - Salinity (ppt)	12		24
As Received - Dissolved Oxygen (mg/L)‡	0.9		7.6
As Received - Ammonia (pull)	-002 i		12597-001
Salinity Adjusted - pH (SU) @ 20°C	6.72	6.97	
Salinity Adjusted - Salinity (ppt)	25	25	
~~After Aeration~~ - Dissolved Oxygen (mg/L)	1.3	4.8	
Salinity Adjusted - Ammonia (pull)		-003 i	
48 hour Ammonia (pull) off sal. adj.	-004	-005	12597-002
48 hour pH (SU) @ 20°C cubes	6.81	7.32	8.05

‡ - Aerate prior to mixing concentrations.

PREPARATION OF DILUTIONS

STUDY: 12584 | CLIENT: CH2M HILL - American Samoa

SPECIES: *A. bahia*

Diluent: Lab Salt	Day: 0 Sample: -001		Day: 2 Sample: 90A					
Concentration	Vol. Eff.	Final Vol	Vol. Eff.	Final Vol	HRS	Date	Time	Initials
LAB	0	1000	0	750	0	10/1/04	1550	BB
3.1%	31		23.25		48	10/3/04	1505	TPM
6.25%	62.5		46.87					
12.5%	125		93.75		Comments:			
25%	250		187.5					
50%	500		375					

RECORD OF METERS USED FOR WATER QUALITY MEASUREMENTS

STUDY: 12584	CLIENT: CH2M HILL - American Samoa					
WATER QUALITIES - A. bahia						
HOURS:	0	24	48 - old	48 - new	72	96
Water Quality Station #	2	2	1	1	2	1
Initials	BB	KY	TP	TP	K	TP
Date	10/1/04	10/2	10/3	10/3	10/4/04	10/5/04

Water Quality Station #1		Water Quality Station #2		COMMENTS
DO meter #	18	DO meter #	3	
DO probe #	10	DO probe #	21	
pH meter #	1097	pH meter #	1138	
pH probe #	40	pH probe #	39	
S/C meter #	YSI 30B	S/C meter #	YSI 30B	
S/C probe #	1	S/C probe #	1	
Salinity meter #	1	Salinity meter #	1	

STUDY: 12584
CLIENT: CH2MHill - American Samoa
PROJECT: Wastewater Treatment Plant
TASK: Unionized Ammonia Calculations

Day / Date	Treatment	Temperature Deg C	Sample pH SU	NH_3 mg/L	Unionized NH_3 mg/L
Day 0	Lab	21	8.05	0.1	0.005
10/01/04	As Received 100% Effluent	21	6.48	59.0	0.076
	50% Salinity Adjusted Effluent	21	6.97	29.0	0.115
					0.000
Day 2	Lab	22	8.05	0.10	0.005
10/03/04	50% Salinity Adjusted Effluent	22	7.32	59.00	0.559
	100% Salinity Adjusted Effluent	22	6.81	29.00	0.085

ESI SAMPLE RECEIPT RECORD

EnviroSystems, Inc.
One Lafayette Road
P.O. Box 778
Hampton, N.H. 03843-0778
(603) 926-3345 • (603) 926-3521 Fax
www.envirosystems.com

ESI STUDY NUMBER: 12584 CLIENT: CH2M – Am. Samoa

SAMPLE RECEIPT:
DATE: 10/1/04 TIME: 1510 BY: BB

DELIVERED VIA: ☐ FEDEX ☐ CLIENT ☐ ESI ☐ UPS ☑ OTHER DHL

LOGGED INTO LAB:
DATE: 10/1/04 TIME: 1510 BY: BB

SAMPLE CONDITION:

CHAIN OF CUSTODY:	☑ YES	☐ NO
CHAIN OF CUSTODY SIGNED:	☑ YES	☐ NO
CHAIN OF CUSTODY COMPLETE: ☐ YES		☑ NO
SAMPLE DATE:	☑ YES	☐ NO
SAMPLE TIME RECORDED:	☐ YES	☑ NO
SAMPLE TYPE IDENTIFIED:	☑ YES	☐ NO
CUSTODY SEAL IN PLACE:	☑ YES	☐ NO
SHIPPING CONTAINER INTACT:	☑ YES	☐ NO
SAMPLE TEMPERATURE (AT ARRIVAL): 21 °C		
DOES CLIENT NEED NOTIFICATION OF TEMPERATURE?	☐ YES	☑ NO
SAMPLE ARRIVED ON ICE:	☐ YES	☑ NO

COMMENTS: 1x 5gal